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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/553,144

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Biagio Passaro

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EXAMINER

DARJI, PRITESH D

ART UNIT

PAPER NUMBER

4181

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/553,144	<b>Applicant(s)</b> PASSARO, BIAGIO	
	<b>Examiner</b> PRITESH DARJI	<b>Art Unit</b> 4181	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 October 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/11/2005</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Specification***

The disclosure is objected to because of the following informalities: Minor spelling errors.

1) "consentration" – on page 7, lines 12

2) "atomise" or "atomization"- page 6,line 6,8. page 7, line 18. page 8, line 4,11.  
page 10, line 3. page 12, line 6.

3) "acqueous" -page 4, line 12, 23. page 6,line 5. page 12, line 2.

4) "inventiono"- page 5, line 2.

Appropriate correction is required.

The disclosure is objected to because of the following informalities:

Page 10, line 9 connects two sentences without using appropriate connector.

Sentence is : "...a water temperature lower than 30° C    the concentration of calcium..."

Appropriate correction is required.

### ***Claim Objections***

Claims 1-3, 4-9, 12 and 13 are objected to because of the following informalities:  
Spelling errors.

2) "atomise" or "atomization"- claim 1, line 2. claim 3, line 4. claim 6, line 5.claim  
9, line 4.claim 12, line 3.

3) "aqueous" –claim 2, line 5. claim 3, line 4. claim 5, line 5. claim 6, line 4. claim 8, line 3. claim 12, line 4.

Appropriate correction is required.

Claim 13 is objected to because of the following informalities

In the line 5, Sentence is : "...a water temperature lower than 30° C the concentration of calcium..."

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Regarding claim 13, the phrase "substantially greater" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d). Examiner requests to remove "substantially greater" and use of range or specific weight percentage number.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-3, 6, 7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asikainen et al.(WO 90/09226) in view of Felsvang et al.( US 4279873).**

Regarding claims 1-3, Asikainen et al. teaches cleaning of flue gases (See page 1, line 5). Flue gas contains sulfur dioxide ( $\text{SO}_2$ ), which is acidic gas. Asikainen further teaches that in the flue gas moistening reactor,  $\text{CaO}$  is hydrated to  $\text{Ca}(\text{OH})_2$ , which binds  $\text{SO}_2$  efficiently and forms calcium sulfite ( See page 5, lines 13-15).  $\text{Ca}(\text{OH})_2$  is a aqueous solution of  $\text{CaO}$  and its binding with  $\text{SO}_2$  shows absorption of  $\text{SO}_2$  by  $\text{Ca}(\text{OH})_2$ . During absorption of  $\text{SO}_2$  from flue gases, the process is automatically purifying flue gases since  $\text{SO}_2$  serves as impurity. Asikainen also teaches that flue gases evaporate all the water to keep stage dry (See page 8, lines 3-5). In the figure 2 by Asikainen, stage 16 works as a reactor, in which evaporation of water takes place. Since reaction is taking place in stage 16 between flue gases and  $\text{Ca}(\text{OH})_2$ , the reaction would inherently heat up  $\text{Ca}(\text{OH})_2$  because of high temperature of flue gases. In addition, it would be inherent to use heat produced by hydration to increase evaporation speed.

Asikainen doesn't expressly teach that atomization is taking place in the present invention.

However, in a process for flue gas desulfurization, Felsvang et al. teaches that atomized calcium hydroxide absorbs  $\text{SO}_2$  from flue gases (See column 1, lines 5-15).

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At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Asikainen by using atomization of calcium hydroxide in view of Felsvang. The suggestion or motivation for doing so would have been that atomizing calcium hydroxide would give more surface area to react with flue gases so more  $\text{SO}_2$  can be absorbed. Since there is a heat involved in the reaction, it would advantageously speed up the process of evaporation.

Regarding claim 6, Asikainen doesn't expressly teach about temperature of calcium oxide.

However, in a process for flue gas desulfurization, Felsvang et al. teaches temperature of flue gas has a temperature range between 8 to 40 °C (See column 3, lines 41-43).

At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Asikainen by using temperature range of flue gas in view of Felsvang. Since flue gas temperature is determined, it would be easy for a person with ordinary skill in art to set temperature of calcium oxide predetermined and control because it's reacting with flue gas, which has temperature determined. The suggestion or motivation for doing so would have been that  $\text{SO}_2$  is absorbed at this temperature with most amount of calcium hydroxide reacted (See column 3, lines 45-57). Controlling temperature would be

very informative to check how temperature affects results and a person with ordinary skills in art would do so.

Regarding claim 7, it would be obvious for an aqueous suspension to continually keep in movement because atomization of aqueous suspension is taking place. Small atomized particle tend to move and in the reactor, movement is needed in order to separate SO<sub>2</sub> from flue gases.

Regarding claim 12, Asikainen doesn't expressly teach about the combustion fumes temperature.

However, in a process for flue gas desulfurization, Felsvang et al. teaches flue gas' temperature to be between 120° C and 190° C (See column 6, lines 62-65)

At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Asikainen by using temperature between 120 °C and 190° C in view of Felsvang. The suggestion or motivation for doing so would have been at this higher temperature water would be easily turned into vapors and atomization of calcium oxide aqueous solution, thus giving advantage of a reaction in which SO<sub>2</sub> is absorbed. Flue gas, atomized CaO solution and water vapor will have good chance of interacting and reacting.

**Claims 8, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asikainen et al.(WO 90/09226) in view of Felsvang et al.( US 4279873) and in further view of Graves et al. ( US 5245095)**

Regarding claims 8,9 and 10, Asikainen and Felsvang do not expressly teach that HCL and/or CaCl<sub>2</sub> is added in the suspension solution.

However, hydrochloric acid (HCL) is an acidic gas, which is a known fact. Therefore, it will react with aqueous suspension of calcium oxide, it is readily apparent that it will result in CaCl<sub>2</sub> by reaction. An example is shown below.



From the reaction above, it could be understood that CaCl<sub>2</sub> can be produced with reaction of CaO and HCl (acidic gas). It wouldn't matter if CaCl<sub>2</sub> or HCL are added before atomization since atomization is used to speed up the reaction.

On the other hand, in the method of extraction of carotenoids from natural sources, Graves teaches that calcium chloride has concentrations from about 0.01 to 10%, preferably about 0.05 to 3 wt% (See column 3, lines 63-65).

At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Asikainen in view of Felsvang using concentration of calcium chloride in further view of Graves. The suggestion or motivation for doing so would have been calcium chloride appears to provide significantly better separation at lower concentrations with other calcium additives (See column 3m lines 58-60).

As outlined above, the reference teaches concentration of CaCl<sub>2</sub> that overlaps claimed ranges and considering the claimed ranges as a whole would have been obvious to one having ordinary skill in the art at the time the invention



was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness, see *In re Malagari*, 182 U.C.P.Q.549; *In re Wertheim* 191 USPQ 90 (CCPA 1976).

**Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Asikainen et al.(WO 90/09226) in view of Felsvang et al.( US 4279873) and in further view of Moran et al.( US 5492685).**

Regarding claim 4, Asikainen doesn't expressly teach about calcium hydroxide's increase in porosity, surface area and a reduced size effecting reactivity.

However, in a method for removing SO<sub>2</sub> from a gas stream, Moran teaches that calcium hydroxide having a high surface area, high porosity and small particle size for use in SO<sub>2</sub> absorption (See column 1, lines 57-60).

At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Asikainen by using calcium hydroxide for better results in view of Moran et al. The suggestion or motivation for doing so would have been that high porosity, high surface area and small particle size of calcium hydroxide has improved SO<sub>2</sub> removal performance (See column 2, lines 53-55).

**Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Asikainen et al.(WO 90/09226) in view of Felsvang et al.( US 4279873) and in further view of Uchiyama et al.( US 3892837).**

Regarding claim 5, Asikainen doesn't expressly teach about CaO amount present in the solution.

However, in a process for removing sulfur dioxides from gases, Uchiyama teaches that liquid absorbent having 5-35 weight percent range (See column 2, lines 52-55).

At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Asikainen by using percentage range of CaO in view of Uchiyama. Turner et al. doesn't expressly teach percentage of CaO in the solution is 75%. However, it would have been obvious at the time of invention to determine the optimal percentage range of suitable CaO percentage through routine experimentation. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In addition, its well known fact that CaO absorbs SO<sub>2</sub> so a person with ordinary skill in art would try to use maximum possible weight percentage of CaO in the solution to remove SO<sub>2</sub>.

**Claims 11, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asikainen et al.(WO 90/09226) in view of Felsvang et al.(US 4279873) and in further view of Ehrlich et al. ( US 4411879).**

Regarding claims 11, 14 and 15, Asikainen and Felsvang do not expressly teach if any sulfur containing compound is associated with calcium oxide.

However, in the method for enhancing the sulfur capture potential of lime, Ehrlich teaches calcium sulfate surrounding calcium gets reacted with calcium oxide after removing partially sulfated limestone. Furthermore, calcium sulfate and calcium oxide ratio stated is 1:1 (See column 2, lines 14-21). Reaction 3 on column 2 also shows how calcium oxide and calcium sulfate is reacted to produce desired products. Ehrlich also teaches by setting temperature at specific range, calcium oxide shows the fastest and most efficient way to convert it to calcium hydroxide, thus stabilizing CaO suspension with organized process (See column 5, example 1).

At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Asikainen in view of Felsvang by adding calcium sulfate to calcium oxide in further view of Ehrlich. The suggestion or motivation for doing so would be to increase reactivity of non reacted calcium oxide (See column 2, lines 16-17). The suggestion or motivation for stabilizing the CaO would be the temperature range, in which it gives high performance so a

person with ordinary skills in the art would be encouraged to control the temperature, which gives high performance.

**Claims 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asikainen et al.(WO 90/09226) in view of Felsvang et al.( US 4279873) and in further view of Van de Walle (US 4834957).**

Regarding claim 13, Asikainen and Felsvang do not expressly state water temperature and concentration of calcium lignin sulphonate.

However, in a method of concentrated suspension of aqueous magnesium oxide, Van de Walle teaches concentration of lignin sulfonate in the magnesium oxide is between 1.0 percent to 5.0 percent (See column 4, lines 57-60). Since magnesium and calcium are same group metals, they would possess same properties. Van de Walle also teaches calcium lignin sulfonate to be used as lignin sulfonate (See column 4, lines 13-16). In the present invention, high temperature gas will be reacted with aqueous suspension of calcium oxide so temperature of water present in the aqueous suspension will not be very critical, since it gets higher temperature while reactioning with combustion gas.

At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Asikainen in view of Felsvang using concentration of calcium lignin sulfonate in further view of Van de Walle. The suggestion or motivation for doing so would have been to improve chemical

stability of the product and also improving viscosity stability (See column 4, lines 10-15).

### ***Conclusion***

No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PRITESH DARJI whose telephone number is (571)270-5855. The examiner can normally be reached on Monday to Thursday 8:00AM EST to 6:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on 571-272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/P. D./

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Examiner, Art Unit 4181

/Vickie Kim/

Supervisory Patent Examiner, Art Unit 4181